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ROLLING OF STAINLESS SHEET STEEL

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7.Rolling of Stainless Sheet Steel (pages 762-765)

Cold rolling of stainless sheet steel is widely used in various branches of national economy: machine construction, chemical, petroleum, food and other industries.

We distinguish chromium and nickel chrome stainless steel, of which the first one belongs to the ferrite group, and the second one - to the austenitic class.

Widest application is given to steel of the austenitic class with a content of about 18% Cr and about 9% Ni, possessing high plasticity, high mechanical and anti corrosion qualities.

Steel of this class when subjected to cold rolling is reinforced and its deformation resistance increases to such an extent that at a summary compression of more than 50% further rolling of same becomes difficult. That is why stainless sheet steel is rolled within certain limits, the number of which depends upon the thickness of the sheet and can reach 3-5. To reduce cold hardening and increase plasticity the stainless steel is subjected to intermediate thermal treatment.

During cold rolling of stainless austenitic steel in the role of thermal processing is applied heating of same to 1100-1150° with subsequent hardening in water or in air. As result a homogeneous austenite is obtained, which secures fine plasticity and high anticorrosion properties of the steel.

Steel of the ferrite class has lower plasticity and it submits less to cold hardening durig cold rolling than austenite steel. Since this type of steel at a temperature of over 850-900° shows greater tendency to growth of grain and intercrystalline corrosion, then in the role of thermal processing annealing at 740-780° is applied; this yields a ferrite-carbide structure securing maximum plasticity and highest anticorrosion properties.

Old type metallurgical plants with small output volume of cold rolled stain

less sheet steel the steel is rolled on single stand quarto machines in form of individual cards. The basic material in this case is hot rolled slab in form of individual sheets, rolled ordinarily into billets in thin sheet lathes duo of linear type.

The modern method of cold rolling stainless sheet steel is rolling in rolls. In this case the basic material are hot rolled rolls coming along from continuous or semicontinuous hot rolling machines or from machines with furnace reelers.

From the hot rolling plant these rolls travel over an underground conveyer to the cold rolling shop.

The rolls of hot rolled stainless sheet steel are first subjecyed to softening hot processing and to etching (pickling). The number of preparatory operations prior to cold rolling, as is known, includes also trimming of side edges, surface grinding of strips for the purpose of removing defects and, in case of rolling on single stand reverse lathes, welding on to the tips of the rolls strips 4-5 m long; the latter in the process of rolling is not reduced .

Stainless sheet steel can be rolled on verious cold rolling machines.

At smaller industrial plants stainless sheet steel is ordinarily rolled on reverse single stand machines quarto and on multiroller machines. At larger industrial volume are used also continuous performance machines, consisting of three and four stands.

However on these machines is ordinarily carried out only the first rolling of hot rolled rolls. The final rolling in this case is also carried out on reverse single stand machines quarto or multiroller machines, having maximum flexibility, which is especially important at a broad rolling program.

Cold rolled stainless sheet steel after final thermal processing is subjected to dressing with reduction of 1-2%. During the dressing are eliminated corrugations and defects in sheet metal; furthermore, thanks to the polishing effect of the thoroughly machines rollers there is an improvement in the surface of the strip. Dressing (temper

rolling) increases also the strength of stainless sheet steel, which for austenitic steel decreases after thermal treatment.

Fig.484. Machine for grinding and polishing stainless sheet steel: a-functional diagram; b- general view.

Upon greater requirements with respect to side strain temper rolling (dressing) of stainless sheet steel is realized within several passes; in some instances sheet steel is subjected to trueing on straightening-stretching machines with subsequent inspection on special testing plates. At times machine building plants need cold hard ened (reinforced) stainless sheet steel. That is why final rolling of such steel is carried out with consideration of obtaining the required mechanical properties and thermal processing after the rolling is not carried out.

A part of the stainless sheet steel after cold rolling is subjected to grind ing and polishing (buffing) on special grinding and buffing machines to obtain par ticularly clean and smooth surface which improves the anticorrosion properties and

outer appearance of products manufactured from such steel.

The machine for polishing (fig.484) the surface of stainless strip consists of unroller 1, guide table 2, buggy 3 with belt 4 and winding drum 5. The lorry is mounted on a cantilever shaft in such a way that it has the possibility of slightly rolling relative to the surface of the strip. The carriage has three rollers enveloped by an infinite belt made of camel wool.

The strip unwinds from the roll set on the unroller, and moves over the guide table to the roller drum at slow rate (1-5 m/min). To the upper surface of the strip at a length of about 1 m is attached a flat belt, moving counter to the strip at a rate of 1-2 m/sec.

To obtain required surface quality a finely dispersed polishing paste is applied on the strip during the process od polishing; in addition, the carriage and belt by themselves execute the rolling motion.

By controlling the polishing process (selecting the quality of belt, paste and relative rate of polishing) it is possible to obtain strip surface of mirror quality, corresponding to the 12-th class of purity.